1891MNRAS..51..311B

having β *Aurigæ* for its centre, or they belong to a remote system of stars in which β *Aurigæ* has no part, and this identity may possibly, therefore, indicate an absolute parallax.

Assuming the conclusions of Professor Vogel's determination of the distance between the centres of the two components of β *Aurigæ* at 1,650,000 geographical miles, it appears that the greatest angular separation of the two components is no more than 0″·005.

1891 *March* 12.

The Companions of Aldebaran. By S. W. Burnham.

I have recently finished a set of measures of the companions of *Aldebaran* with the large telescope, and these taken in connection with prior measures are of considerable interest in showing the relations existing between the bright star and its several attendants. The nearest companion was found with the Chicago 18½-inch refractor in 1877, and this is now shown to have the same proper motion as the principal star; a result which would not be expected considering the distance and great difference in magnitudes. Both distance and position angle appear to have remained unchanged, the small difference in measures being fully accounted for by the extreme minuteness of the companion and the difficulty of measuring it so near a first-magnitude star. It was a very difficult object to see with the Chicago telescope, and might easily be overlooked even with the 36-inch refractor. I give below all the measures that have been made of this star.

The more distant Herschel companion has been observed for more than a hundred years, and the change shown by the measures has usually been ascribed solely to the proper motion of *Aldebaran.* The distinguished French astronomer Flammarion was the first to notice the fact that the well-known proper motion of A could not account for the relative change, and therefore came to the conclusion that B must have a proper motion of its own, and in a different direction. Of the correctness of this view there can be no doubt, and the amount and direction of the relative displacement of C should be as well known as of most stars. This motion is almost exactly half that of A, and is perhaps larger than that of any known star as faint as the eleventh magnitude which is not connected and moving with some brighter component.

In looking at this object in 1888 with the 36-inch, I found that the Herschel companion was also double, or had a very faint attendant a little more than 2″ distant. This is too difficult for most telescopes, and I am not aware that it has been seen elsewhere. It was measured in 1888, and again this year.

The several positions of B and C, as shown by the measures,

1891MNRAS..51..311B

are given accurately to scale on the diagram (Plate 4). The annual proper motion of A is taken as 0″·188 in the direction of 164°·4. The central position of A is for the date of Struve's measure of C (1836); and the later measures are laid off from the actual place of A along the line of its movement, as determined by the proper motion already given. In the same manner the positions of B are laid down, the first and last measures in each case being connected with A by the lines shown in the diagram.

The following are the measures used:—

A and B (β 550).

1877·89	109°·0	30″·45	β	3*n*
1878·00	110·5	31·26	Hl	3*n*
1880·11	111·2	31·46	β	2*n*
1888·82	109·5	30·90	β	2*n*
1890·87	109·0	31·34	β	3*n*

A and C (H VI. 66).

1836·06	36°·0	109″·04	Σ	2*n*
1851·40	35·5	111·60	OΣ	
1864·24	34·8	112·79	De	6*n*
1887·00	34·5	116·27	Hl	20*n*
1889·98	34·6	116·97	β	7*n*

C and D (β 1031).

1888·81	281°·1	2″·34	β	3*n*
1890·86	279·1	1·84	β	4*n*

It is apparent from the measures of B that its proper motion is substantially, and probably exactly, the same as that of A. The mean of the five sets of measures of this companion for the angle is 109°·8, and for the distance 31″·08. The differences between these values and the separate measures are really very small when the extreme faintness of the companion is taken into account.

From the measures of C we find that this companion has an annual motion of 0″·095 in the direction of about 109°·6. I have not used Herschel's measure of 1781, making the angle 36°·0, and the distance 87″·75. At best this would be only approximate. By the assumed motion of the stars, the angle at this time should have been 38°, and the distance 102″. Evidently at one time these stars were much nearer together; and by carrying the motions back it is shown that the minimum distance of 40″ occurred about A.D. 1130. At this time the

1891MNRAS..51..311B

distance of BC was less than 11″; and about the middle of that century it was a little less than 9″.

The measures of CD do not cover a sufficient time to tell with certainty what the relation of D is to this group. As the angle of CD is nearly in the line of the motion of C, the distance between these stars should be about 0″·2 more in 1890 than in 1888, if D does not share the motion of C; but from the measures this distance is 0″·5 less at the former date. This would appear to indicate that the proper motion was common to both stars, and that there was a relative change due to some other cause. Measures made two or three years hence will at once settle this question.

The Herschel companion is the star generally used for the determination of the differential parallax of *Aldebaran*; but as the proper motion of the small star does not appear to have been taken into account, the result obtained would seem to be materially affected by an error from this source.

Mount Hamilton: 1890 *December* 25.

The Orbit of κ Pegasi (β 989). By S. W. Burnham.

On August 12, 1880, while observing with the 18·5-inch refractor of the Dearborn Observatory, I came across the wide pair, κ *Pegasi*, and at once saw that the large star was a very close double. The measures made on this and following nights gave a distance of 0″·27, and this I thought was more likely to be too large than otherwise (*Monthly Notices*, xli. p. 33). I was unable to give any further attention to this star until the commencement of my measures made at the Lick Observatory, and the extreme difficulty of measuring so close a pair seems to have deterred other observers, with a single exception, from doing anything with it. The only record of any other observation of any kind is found in the work of the late Dr. Engelmann, of Leipzig. When we consider that his telescope had an aperture of only about 7·5 inches, it is almost wonderful that he could get even an approximate position, notwithstanding it was a Clark objective, and shows his great skill as an observer, and the superior defining qualities of his instrument. It is unfortunate that we have so little to represent the extraordinary motion of this pair in a few years through an angle of 230°. Since I have been at Mount Hamilton I have measured the close pair each year with the 36-inch refractor. During the measures of the past year it was extremely difficult, and was a severe test of the power of the great telescope with the very best atmospheric conditions. The highest powers were, of course, used, and it was necessary not only to exercise the utmost care in